OWASP
The Open Web Application Security Project

Cornucopia

Ecommerce Website Edition v1.20-EN

OWASP Cornucopia is a mechanism to assist software development teams identify security requirements in Agile, conventional and formal development processes

Author
Colin Watson

Project Leaders
Colin Watson and Darío De Filippis

Reviewers
Tom Brennan, Johanna Curiel and Timo Goosen

Acknowledgments

Microsoft SDL Team for the Elevation of Privilege Threat Modelling Game, published under a Creative Commons Attribution license, as the inspiration for Cornucopia and from which many ideas, especially the game theory, were copied.

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Introduction

The idea behind Cornucopia is to help development teams, especially those using Agile methodologies, to identify application security requirements and develop security-based user stories. Although the idea had been waiting for enough time to progress it, the final motivation came when SAFECode published its Practical Security Stories and Security Tasks for Agile Development Environments in July 2012.

The Microsoft SDL team had already published its super Elevation of Privilege: The Threat Modeling Game (EoP) but that did not seem to address the most appropriate kind of issues that web application development teams mostly have to address. EoP is a great concept and game strategy, and was published under a Creative Commons Attribution License.

Cornucopia Ecommerce Website Edition is based the concepts and game ideas in EoP, but those have been modified to be more relevant to the types of issues ecommerce website developers encounter. It attempts to introduce threat-modelling ideas into development teams that use Agile methodologies, or are more focused on web application weaknesses than other types of software vulnerabilities or are not familiar with STRIDE and DREAD.

Cornucopia Ecommerce Website Edition is referenced as an information resource in the PCI Security Standard Council's Information Supplement PCI DSS E-commerce Guidelines, v2, January 2013.

The card deck (pack)

Instead of EoP's STRIDE suits (sets of cards with matching designs), Cornucopia suits are based on the structure of the OWASP Secure Coding Practices - Quick Reference Guide (SCP), but with additional consideration of sections in the OWASP Application Security Verification Standard, the OWASP Testing Guide and David Rook's Principles of Secure Development. These provided five suits, and a sixth called "Cornucopia" was created for everything else:

- Data validation and encoding (VE)
- Authentication (AT)
- Session Management (SM)
- Authorization (AZ)
- Cryptography (CR)
- Cornucopia (C)

Similar to poker-playing cards, each suit contains 13 cards (Ace, 2-10, Jack, Queen and King) but, unlike EoP, there are also two Joker cards. The content was mainly drawn from the SCP.

Mappings

The other driver for Cornucopia is to link the attacks with requirements and verification techniques. An initial aim had been to reference CWE weakness IDs, but these proved too numerous, and instead it was decided to map each card to CAPEC software attack pattern IDs which themselves are mapped to CWEs, so the desired result is achieved.

Each card is also mapped to the 36 primary security stories in the SAFECode document, as well as to the OWASP SCP v2, ASVS v3.0.1 and AppSensor (application attack detection and response) to help teams create their own security-related stories for use in Agile processes.

Game strategy

Apart from the content differences, the game rules are virtually identical to those for EoP.

Printing the cards

Check the Cornucopia project page for how to obtain pre-printed decks on glossy card.

The cards can be printed from this document in black & white but are more effective in color. The cards in the later pages of this document have been laid out to fit on one type of pre-scored business A4 card sheets. This appeared to be the quickest way to initially provide to create playing cards quickly. Avery product codes C32015 and C32030 have been tested successfully, but any 10 up 85mm x 54 mm cards on A4 paper should work with a little adjustment. Other stationery suppliers like Ryman and Sigel produce similar sheets. These card sheets are not inexpensive, so care should be taken in deciding what to print and using what media and printer type.

The cards can of course just be printed on any size of paper or card and then cut-up manually, or a commercial printer would be able to print larger volumes and cut the cards to size. The cut lines are shown on the penultimate page of this document, but Avery also produce a landscape A4 template (A-0017-01_L.doc) that can be used as a guide.

Printing and cutting up can take an hour or so, and using a faster printer helps. Try to print add higher quality to increase legibility. An optional card back design (in OWASP tartan) has been provided as the last page of this document. There is no special alignment needed. Dual-sided printing needs special care taken. You could customize the card faces or the backs for your own organization's preferences.

Customization

After you have used Cornucopia a few times, you may feel that some cards are less relevant to your applications, or the threats are different for your organization. Edit this document yourself to make the cards more suitable for your teams, or create new decks completely.

Provide feedback

If you have ideas or feedback on the use of OWASP Cornucopia, please share them. Even better if you create alternative versions of the cards, or produce professional print-ready versions, please share that with the volunteers who created this edition and with the wider application development and application security community.

The best place to use to discuss or contribute is the mailing list for the OWASP project:

- Mailing list
  https://lists.owasp.org/mailman/listinfo/owasp_cornucopia
- Project home page
  https://www.owasp.org/index.php/OWASP_Cornucopia

Instructions

The text on each card describes an attack, but the attacker is given a name, which are unique across all the cards. The name can represent a computer system (e.g. the database, the file system, another application, a related service, a botnet), an individual person (e.g. a citizen, a customer, a client, an employee, a criminal, a spy), or even a group of people (e.g. a competitive organization, activists with a common cause). The attacker might be remote in some other device/location, or local/internal with access to the same device, host or network as the application is running on. The attacker is always named at the start of each description. An example is:

> *William has control over the generation of session identifiers*

This means the attacker (William) can create new session identifiers that the application accepts. The attacks were primarily drawn from the security requirements listed in the SCP, v2 but then supplemented with verification objectives from the OWASP "Application Security Verification Standard for Web Applications", the security focused stories in SAFECode's "Practical Security Stories and Security Tasks for Agile Development Environments", and finally a review of the cards in EOP.

Further guidance about each card is available in the online Wiki Deck at https://www.owasp.org/index.php/Cornucopia_-_Ecommerce_Website_Edition_-_Wiki_Deck

Lookups between the attacks and five resources are provided on most cards:

- Requirements in "Secure Coding Practices (SCP) - Quick Reference Guide", v2, OWASP, November 2010 https://www.owasp.org/index.php/File:OWASP_SCP_Quick_Reference_Guide_v2.pdf
- Verification IDs in "Application Security Verification Standard (ASVS) for Web Applications", OWASP, v3.0.1, 2016 (excluding sections 18 and 19) https://www.owasp.org/images/3/33/OWASP_Application_Security_Verification_Standard_3.0.1.pdf
- Attack detection points IDs in "AppSensor", OWASP, August 2010-2015 https://www.owasp.org/index.php/AppSensor_DetectionPoints
- IDs in "Common Attack Pattern Enumeration and Classification (CAPEC)", v2.8, Mitre Corporation, November 2015 http://capec.mitre.org/data/archive/capec_v2.8.zip
- Security-focused stories in "Practical Security Stories and Security Tasks for Agile Development Environments", SAFECode, July 2012 http://www.safecode.org/publications/SAFECode_Agile_Dev_Security0712.pdf

A look-up means the attack is included within the referenced item, but does not necessarily encompass the whole of its intent. For structured data like CAPEC, the most specific reference is provided but sometimes a cross-reference is provided that also has more specific (child) examples. There are no lookups on the six Aces and two Jokers. Instead these cards have some general tips in italicized text.

It is possible to play Cornucopia in many different ways. Here is one way, demonstrated online in a video at https://youtu.be/i5Y0akWj31k, which uses the new (May 2015) score/record sheet at https://www.owasp.org/index.php/File:Cornucopia-scoresheet.pdf

A - Preparations

A1. Obtain a deck, or print your own deck of Cornucopia cards (see page 2 of this document) and separate/cut out the cards
A2. Identify an application or application process to review; this might be a concept, design or an actual implementation
A3. Create a data flow diagram, user stories, or other artefacts to help the review
A4. Identify and invite a group of 3-6 architects, developers, testers and other business stakeholders together and sit around a table (try to include someone fairly familiar with application security)
A5. Have some prizes to hand (gold stars, chocolate, pizza, beer or flowers depending upon your office culture)

B - Play

One suit - *Cornucopia* - acts as trumps. Aces are high (i.e. they beat Kings). It helps if there is a non-player to document the issues and scores..

B1. Remove the Jokers and a few low-score (2, 3, 4) cards from *Cornucopia* suit to ensure each player will have the same number of cards
B2. Shuffle the deck and deal all the cards
B3. To begin, choose a player randomly who will play the first card - they can play any card from their hand except from the trump suit - *Cornucopia*
B4. To play a card, each player must read it out aloud, and explain (see the online Wiki Deck for tips) how the threat could apply (the player gets a point for attacks that might work which the group thinks is an actionable bug) - do not try to think of mitigations at this stage, and do not exclude a threat just because of a belief that it is already mitigated - someone note the card and record the issues raised
B5. Play clockwise, each person must play a card in the same way; if you have any card of the matching lead suit you must play one of those, otherwise they can play a card from any other suit. Only a higher card of the same suit, or the highest card in the trump suit *Cornucopia*, wins the hand
B6. The person who wins the round, leads the next round (i.e. they play first), and thus defines the next lead suit
B7. Repeat until all the cards are played

C - Scoring

The objective is to identify applicable threats, and win hands (rounds):

C1. Score +1 for each card you can identify as a valid threat to the application under consideration
C2. Score +1 if you win a round
C3. Once all cards have been played, whoever has the most points wins

D - Closure

D1. Review all the applicable threats and the matching security requirements
D2. Create user stories, specifications and test cases as required for your development methodology.

Alternative game rules

If you are new to the game, remove the Aces and two Joker cards to begin with. Add the Joker cards back in once people become more familiar with the process. Apart from the "trumps card game" rules described above which are very similar to the EoP, the deck can also be played as the "twenty-one card game" (also known as "pontoon" or "blackjack") which normally reduces the number of cards played in each round.

Practice on an imaginary application, or even a future planned application, rather than trying to find fault with existing applications until the participants are happy with the usefulness of the game.

Consider just playing with one suit to make a shorter session – but try to cover all the suits for every project. Or even better just play one hand with some pre-selected cards, and score only on the ability to identify security requirements. Perhaps have one game of each suit each day for a week or so, if the participants cannot spare long enough for a full deck.

Some teams have preferred to play a full hand of cards, and then discuss what is on the cards after each round (instead of after each person plays a card).

Another suggestion is that if a player fails to identify the card is relevant, allow other players to suggest ideas, and potentially let them gain the point for the card. Consider allowing extra points for especially good contributions.

You can even play by yourself. Just use the cards to act as thought-provokers. Involving more people will be beneficial though.

In Microsoft's EoP guidance, they recommend cheating as a good game strategy.

Development framework-specific modified card decks

At the end of 2012, the OWASP Framework Security Matrix was published which documents built in security controls in some commonly used languages and frameworks for web and mobile application development. With certain provisos it is useful to consider how using these controls can simplify the identification of additional requirements – provided of course the controls are included, enabled and configured correctly.

Consider removing the following cards from the decks if you are confidence they are addressed by the way you are using the language/framework. Items in parentheses are "maybes".

Internal coding standards and libraries

Add your own list of excluded cards based on your organisation's coding standards (provided they are confirmed by appropriate verification steps in the development lifecycle).

Your coding standards and libraries		
Data validation and encoding *[your list]*	Session management *[your list]*	Cryptography *[your list]*
Authentication *[your list]*	Authorization *[your list]*	Cornucopia *[your list]*

Compliance requirement decks

Create a smaller deck by only including cards for a particular compliance requirement.

Compliance requirement		
Data validation and encoding *[compliance list]*	Session management *[compliance list]*	Cryptography *[compliance list]*
Authentication *[compliance list]*	Authorization *[compliance list]*	Cornucopia *[compliance list]*

Frequently asked questions

1. Can I copy or edit the game?
Yes of course. All OWASP materials are free to do with as you like provided you comply with the Creative Commons Attribution-ShareAlike 3.0 license. Perhaps if you create a new version, you might donate it to the OWASP Cornucopia Project?

2. How can I get involved?
Please send ideas or offers of help to the project's mailing list.

3. How were the attackers' names chosen?
EoP begins every description with words like "An attacker can...". These have to be phrased as an attack but I was not keen on the anonymous terminology, wanting something more engaging, and therefore used personal names. These can be thought of as external or internal people or aliases for computer systems. But instead of just random names, I thought how they might reflect the OWASP community aspect. Therefore, apart from "Alice and Bob", I use the given (first) names of current and recent OWASP employees and Board members (assigned in no order), and then randomly selected the remaining 50 or so names from the current list of paying individual OWASP members. No name was used more than once, and where people had provided two personal names, I dropped one part to try to ensure no-one can be easily identified. Names were not deliberately allocated to any particular attack, defence or requirement. The cultural and gender mix simply reflects theses sources of names, and is not meant to be world-representative. In v1.20, the name on VE-10 changed to reflect the project's new co-leader - this card is also the only one with two names in the attack.

4. Why aren't there any images on the card faces?
There is quite a lot of text on the cards, and the cross-referencing takes up space too. But it would be great to have additional design elements included. Any volunteer

5. Are the attacks ranked by the number on the card?
Only approximately. The risk will be application and organisation dependent, due to varying security and compliance requirements, so your own severity rating may place the cards in some other order than the numbers on the cards.

6. How long does it take to play a round of cards using the full deck?
This depends upon the amount of discussion and how familiar the players are with application security concepts. But perhaps allow 1.5 to 2.0 hours for 4-6 people.

7. What sort of people should play the game?
Always try to have a mix of roles who can contribute alternative perspectives. But include someone who has a reasonable knowledge of application vulnerability terminology. Otherwise try to include a mix of architects, developers, testers and a relevant project manager or business owner.

8. Who should take notes and record scores?
It is better if that someone else, not playing the game, takes notes about the requirements identified and issues discussed. This could be used as training for a more junior developer, or performed by the project manager. Some organisations have made a recording to review afterwards when the requirements are written up more formally.

9. Should we always use the full deck of cards?
No. A smaller deck is quicker to play. Start your first game with only enough cards for two or three rounds. Always consider removing cards that are not appropriate at all of the target application or function being reviewed. For the first few times people play the game it is also usually better to remove the Aces and the two Jokers. It is also usual to play the game without any trumps suit until people are more familiar with the idea.

10. What should players do when they have an Ace card that says "invented a new X attack"?
The player can make up any attack they think is valid, but must match the suit of the card e.g. data validation and encoding). With players new to the game, it can be better to remove these to begin with (see also FAQ 9).

11. I don't understand what the attack means on each card - is there more detailed information?
Yes, the online Wiki Deck at was created to help players understand the attacks. See https://www.owasp.org/index.php/Cornucopia_-_Ecommerce_Website_Edition_-_Wiki_Deck

12. My company wants to print its own version of OWASP Cornucopia - what license do we need to refer to?
Please refer to the full answer to this question on the project's web pages at https://www.owasp.org/index.php/OWASP_Cornucopia_-_tab=FAQs

${VE_SUIT}

A

${VE_VEA_desc}

${VE_VEA_misc}

${VE_SUIT}

(${Common_NoCard})

${VE_SUIT}

2

${VE_VE2_desc}

OWASP SCP
69, 107-109, 136, 137, 153, 156, 158, 162

OWASP ASVS
1.10, 4.5, 8.1, 11.5, 19.1, 19.5

OWASP AppSensor
HT1-3

CAPEC
54, 541

SAFECODE
4, 23

${VE_SUIT}

3

${VE_VE3_desc}

OWASP SCP
8, 9, 11-14, 16, 159, 190, 191

OWASP ASVS
5.1, 5.16, 5.17, 5.18, 5.19, 5.20, 11.1, 11.2

OWASP AppSensor
RE7-8, AE4-7, IE2-3,CIE1,CIE3-4,HT1-3

CAPEC
28,48,126,165,213,220,221,261,262,271,272

SAFECODE
3, 16, 24, 35

${VE_SUIT}

4

${VE_VE4_desc}

OWASP SCP
8, 10, 183

OWASP ASVS
4.16, 5.16, 5.17, 15.1

OWASP AppSensor
RE3-6,AE8-11,SE1,3-6,IE2-4,HT1-3

CAPEC
28, 31, 48, 126, 162, 165, 213, 220, 221,261

SAFECODE
24, 35

${VE_SUIT}

5

${VE_VE5_desc}

OWASP SCP
3, 15, 18-22 168

OWASP ASVS
1.7, 5.15, 5.21, 5.22, 5.23

OWASP AppSensor
-

CAPEC
28, 31, 152, 160, 468

SAFECODE
2, 17

${VE_SUIT}

6

${VE_VE6_desc}

OWASP SCP
3, 168

OWASP ASVS
1.7, 5.6, 5.19

OWASP AppSensor
IE2-3

CAPEC
28

SAFECODE
3, 16, 24

${VE_SUIT}

7

${VE_VE7_desc}

OWASP SCP
4, 5, 7, 150

OWASP ASVS
5.6, 11.8

OWASP AppSensor
IE2-3, EE1-2

CAPEC
28, 153, 165

SAFECODE
3, 16, 24

${VE_SUIT}

8

${VE_VE8_desc}

OWASP SCP 15, 169
OWASP ASVS 1.7, 5.21, 5.23
OWASP AppSensor -
CAPEC 28, 31, 152, 160, 468
SAFECODE 2, 17

${VE_SUIT}

9

${VE_VE9_desc}

OWASP SCP 6, 21, 22, 168
OWASP ASVS 5.3
OWASP AppSensor IE2-3
CAPEC 28
SAFECODE 3, 16, 24

${VE_SUIT}

10

${VE_VE10_desc}

OWASP SCP 2, 19, 92, 95, 180
OWASP ASVS 5.19, 10.6, 16.2, 16.3, 16.4, 16.5, 16.8
OWASP AppSensor IE4, IE5
CAPEC 12, 51, 57, 90,111,145,194,195,202,218,463
SAFECODE 14

${VE_SUIT}

J

${VE_VEJ_desc}

OWASP SCP 1, 17
OWASP ASVS 5.5, 5.18
OWASP AppSensor RE3, RE4
CAPEC 87, 207, 554
SAFECODE 2, 17

${VE_SUIT}

Q

${VE_VEQ_desc}

OWASP SCP 10, 15, 16, 19, 20
OWASP ASVS 5.15, 5.22, 5.23, 5.24, 5.25
OWASP AppSensor IE1, RP3
CAPEC 28, 31, 152, 160, 468
SAFECODE 2, 17

${VE_SUIT}

K

${VE_VEK_desc}

OWASP SCP 15, 19-22, 167, 180, 204, 211, 212
OWASP ASVS 5.10, 5.11, 5.12, 5.13, 5.14, 5.16, 5.21
OWASP AppSensor CIE1-2
CAPEC 23, 28, 76, 152, 160, 261
SAFECODE 2, 19, 20

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(${Common_NoCard})

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A

${AT_ATA_desc}

${AT_ATA_misc}

${AT_SUIT}

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${AT_SUIT}

2

${AT_AT2_desc}

OWASP SCP 47, 52
OWASP ASVS 2.12, 8.4, 8.10
OWASP AppSensor UT1
CAPEC -
SAFECODE 28

${AT_SUIT}

3

${AT_AT3_desc}

OWASP SCP 36-7, 40, 43, 48, 51, 119, 139-40, 146
OWASP ASVS 2.2, 2.17, 2.24, 8.7, 9.1, 9.4, 9.5, 9.9, 9.11
OWASP AppSensor -
CAPEC 37, 546
SAFECODE 28

${AT_SUIT}

4

${AT_AT4_desc}

OWASP SCP 33, 53
OWASP ASVS 2.18, 2.28
OWASP AppSensor AE1
CAPEC 383
SAFECODE 28

${AT_SUIT}

5

${AT_AT5_desc}

OWASP SCP 54, 175, 178
OWASP ASVS 2.19
OWASP AppSensor AE12, HT3
CAPEC 70
SAFECODE 28

${AT_SUIT}

6

${AT_AT6_desc}

OWASP SCP 37, 45, 46, 178
OWASP ASVS 2.22
OWASP AppSensor -
CAPEC 50
SAFECODE 28

${AT_SUIT}

7

${AT_AT7_desc}

OWASP SCP 33, 38, 39, 41, 50, 53
OWASP ASVS 2.7, 2.20, 2.23, 2.25, 2.27
OWASP AppSensor AE2, AE3
CAPEC 2, 16
SAFECODE 27

${AT_SUIT}

8

${AT_AT8_desc}

OWASP SCP 28
OWASP ASVS 2.6
OWASP AppSensor -
CAPEC 115
SAFECODE 28

${AT_SUIT}

9

${AT_AT9_desc}

OWASP SCP 55, 56
OWASP ASVS 2.1, 2.9, 2.26, 2.31, 4.15
OWASP AppSensor -
CAPEC 21
SAFECODE 14, 28

${AT_SUIT}

10

${AT_AT10_desc}

OWASP SCP 25, 26, 27
OWASP ASVS 1.7, 2.30
OWASP AppSensor -
CAPEC 90, 115
SAFECODE 14, 28

${AT_SUIT}

J

${AT_ATJ_desc}

OWASP SCP 23, 32, 34
OWASP ASVS 2.1
OWASP AppSensor -
CAPEC 115
SAFECODE 14, 28

${AT_SUIT}

Q

${AT_ATQ_desc}

OWASP SCP 23, 29, 42, 49
OWASP ASVS 2.1, 2.8
OWASP AppSensor -
CAPEC 36, 50, 115, 121, 179
SAFECODE 14, 28

${AT_SUIT}

K

${AT_ATK_desc}

OWASP SCP 24
OWASP ASVS 2.4, 13.2
OWASP AppSensor -
CAPEC 115, 207, 554
SAFECODE 14, 28

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A

${SM_SMA_desc}

${SM_SMA_misc}

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${SM_SUIT}

2

${SM_SM2_desc}

OWASP SCP 58, 59
OWASP ASVS 3.10
OWASP AppSensor SE2
CAPEC 31, 60, 61
SAFECODE 28

${SM_SUIT}

3

${SM_SM3_desc}

OWASP SCP 68
OWASP ASVS 3.16, 3.17, 3.18
OWASP AppSensor -
CAPEC -
SAFECODE 28

${SM_SUIT}

4

${SM_SM4_desc}

OWASP SCP 59, 61
OWASP ASVS 3.12
OWASP AppSensor SE2
CAPEC 31, 61
SAFECODE 28

${SM_SUIT}

5

${SM_SM5_desc}

OWASP SCP 60, 62, 66, 67, 71, 72
OWASP ASVS 3.2, 3.7, 3.11
OWASP AppSensor SE4-6
CAPEC 31
SAFECODE 28

${SM_SUIT}

6

${SM_SM6_desc}

OWASP SCP 64, 65
OWASP ASVS 3.3, 3.4, 3.16, 3.17, 3.18
OWASP AppSensor SE5, SE6
CAPEC 21
SAFECODE 28

${SM_SUIT}

7

${SM_SM7_desc}

OWASP SCP 62, 63
OWASP ASVS 3.2, 3.5
OWASP AppSensor -
CAPEC 21
SAFECODE 28

${SM_SUIT}

8

${SM_SM8_desc}

OWASP SCP 96
OWASP ASVS -
OWASP AppSensor -
CAPEC 21
SAFECODE 28

${SM_SUIT}

9

${SM_SM9_desc}

OWASP SCP 69, 75, 76, 119, 138
OWASP ASVS 3.6, 8.7, 10.3
OWASP AppSensor SE4-6
CAPEC 31, 60
SAFECODE 28

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10

${SM_SM10_desc}

OWASP SCP 73, 74
OWASP ASVS 4.13
OWASP AppSensor IE4
CAPEC 62, 111
SAFECODE 18

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J

${SM_SMJ_desc}

OWASP SCP -
OWASP ASVS 15.1, 15.2
OWASP AppSensor IE5
CAPEC 60
SAFECODE 12, 14

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Q

${SM_SMQ_desc}

OWASP SCP 58
OWASP ASVS 3.1
OWASP AppSensor -
CAPEC 21
SAFECODE 14, 28

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K

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OWASP SCP 58, 60
OWASP ASVS 1.7
OWASP AppSensor -
CAPEC 21
SAFECODE 14, 28

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(${Common_NoCard})

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A

${AZ_AZA_desc}

${AZ_AZA_misc}

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2

${AZ_AZ2_desc}

OWASP SCP
44

OWASP ASVS
4.1, 4.16, 16.1

OWASP AppSensor
-

CAPEC
153

SAFECODE
8, 10, 11

${AZ_SUIT}

3

${AZ_AZ3_desc}

OWASP SCP
51, 100, 135, 139, 140, 141, 150

OWASP ASVS
4.1, 8.2, 9.1-9.6, 9.11, 16.6, 16.7

OWASP AppSensor
-

CAPEC
69, 213

SAFECODE
8, 10, 11

${AZ_SUIT}

4

${AZ_AZ4_desc}

OWASP SCP
79, 80

OWASP ASVS
4.8

OWASP AppSensor
-

CAPEC
122

SAFECODE
8, 10, 11

${AZ_SUIT}

5

${AZ_AZ5_desc}

OWASP SCP 70,81,83-4,87-9, 99,117,131-2,142,154,170,179

OWASP ASVS
4.1, 4.4, 4.9,, 19.3

OWASP AppSensor
ACE1-4, HT2

CAPEC
75, 87, 95, 126, 149, 155, 203, 213, 264-5

SAFECODE
8, 10, 11, 13

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6

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OWASP SCP
81, 88, 131

OWASP ASVS
4.1, 4.4

OWASP AppSensor
ACE1-4

CAPEC
122

SAFECODE
8, 10, 11

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OWASP SCP
81, 85, 86, 131

OWASP ASVS
4.1, 4.4

OWASP AppSensor
ACE1-4

CAPEC
122

SAFECODE
8, 10, 11

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OWASP SCP
10, 32, 93, 94, 189

OWASP ASVS
4.10, 4.15, 4.16, 8.13, 15.1

OWASP AppSensor
ACE3

CAPEC
25, 39, 74, 162, 166, 207

SAFECODE
8, 10, 11, 12

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9

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OWASP SCP
94

OWASP ASVS
4.14, 15.2

OWASP AppSensor
AE3, FIO1-2, UT2-4, STE1-3

CAPEC
26, 29, 119, 261

SAFECODE
1, 35

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OWASP SCP
78, 91

OWASP ASVS
1.7, 4.11

OWASP AppSensor
ACE1-4

CAPEC
36, 95, 121, 179

SAFECODE
8, 10, 11

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OWASP SCP
89, 90

OWASP ASVS
4.10, 13.2

OWASP AppSensor
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CAPEC
75, 133, 203

SAFECODE
8, 10, 11

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OWASP SCP
209

OWASP ASVS
5.12

OWASP AppSensor
-

CAPEC
17, 30, 69, 234

SAFECODE
8, 10, 11

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OWASP SCP
77, 89, 91

OWASP ASVS
4.9, 4.10, 13.2

OWASP AppSensor
-

CAPEC
207, 554

SAFECODE
8, 10, 11

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OWASP SCP 105, 133, 135
OWASP ASVS -
OWASP AppSensor -
CAPEC -
SAFECODE 21, 29

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OWASP SCP 92, 205, 212
OWASP ASVS 8.11, 11.7, 13.2, 19.5, 19.6, 19.7, 19.8
OWASP AppSensor SE1, IE4
CAPEC 31, 39, 68, 75, 133, 145, 162, 203,438-9,442
SAFECODE 12, 14

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OWASP SCP 37, 88, 143, 214
OWASP ASVS 7.12, 9.2
OWASP AppSensor -
CAPEC 185, 186, 187
SAFECODE 14, 29, 30

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OWASP SCP 103, 145
OWASP ASVS 7.2, 10.3
OWASP AppSensor -
CAPEC -
SAFECODE 21, 29

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${CR_CR6_desc}

OWASP SCP 36, 37, 143, 146, 147
OWASP ASVS 2.16, 9.2, 9.11, 10.3, 19.2
OWASP AppSensor -
CAPEC 31, 57, 102, 157, 158, 384, 466, 546
SAFECODE 29

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OWASP SCP 75, 144, 145, 148
OWASP ASVS 10.1, 10.5, 10.10, 10.11, 10.12, 10.13, 10.14
OWASP AppSensor IE4
CAPEC 31, 216
SAFECODE 14, 29, 30

${CR_SUIT}

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${CR_CR8_desc}

OWASP SCP
30, 31, 70, 133, 135

OWASP ASVS
2.13, 7.7, 7.8, 9.2

OWASP AppSensor
-

CAPEC
31, 37, 55

SAFECODE
21, 29, 31

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OWASP SCP
60, 104, 105

OWASP ASVS
7.6, 7.7, 7.8, 7.15

OWASP AppSensor
-

CAPEC
97

SAFECODE
14, 21, 29, 32, 33

${CR_SUIT}

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${CR_CR10_desc}

OWASP SCP
104, 105

OWASP ASVS
-

OWASP AppSensor
-

CAPEC
97, 463

SAFECODE
14, 21, 29, 31, 32, 33

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J

${CR_CRJ_desc}

OWASP SCP
35, 90, 171, 172

OWASP ASVS
2.29

OWASP AppSensor
-

CAPEC
116

SAFECODE
21, 29

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Q

${CR_CRQ_desc}

OWASP SCP
35, 102

OWASP ASVS
7.8, 7.9, 7.11, 7.13, 7.14

OWASP AppSensor
-

CAPEC
116, 117

SAFECODE
21, 29

${CR_SUIT}

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OWASP SCP
31, 101

OWASP ASVS
7.11

OWASP AppSensor
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CAPEC
207, 554

SAFECODE
14, 21, 29

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OWASP SCP
194-202, 205-209

OWASP ASVS
5.1

OWASP AppSensor
-

CAPEC
25, 26, 29, 96, 123-4, 128-9, 264-5

SAFECODE
3, 5-7, 9, 22, 25-26, 34

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OWASP SCP
134

OWASP ASVS
19.5

OWASP AppSensor
-

CAPEC
189, 207

SAFECODE
-

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4

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OWASP SCP
23, 32, 34, 42, 51, 181

OWASP ASVS
8.10

OWASP AppSensor
-

CAPEC
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SAFECODE
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OWASP SCP
-

OWASP ASVS
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OWASP AppSensor
-

CAPEC
89, 103, 181, 459

SAFECODE
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OWASP SCP
109, 110, 111, 112, 155

OWASP ASVS
8.2, 8.4

OWASP AppSensor
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CAPEC
54, 98, 164

SAFECODE
4, 11, 23

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${CO_CO7_desc}

OWASP SCP
113-115, 117, 118, 121-130

OWASP ASVS
2.12, 8.3-8.12, 9.10, 10.4

OWASP AppSensor
-

CAPEC
93

SAFECODE
4

${CO_SUIT}

8

${CO_CO8_desc}

OWASP SCP
151, 152, 156, 160, 161, 173-177

OWASP ASVS
19.1, 19.4, 19.6, 19.7, 19.8

OWASP AppSensor
RE1, RE2

CAPEC
37, 220, 310, 436, 536

SAFECODE
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${CO_CO9_desc}

OWASP SCP
23, 29, 56, 81, 82, 84-90

OWASP ASVS
2.1, 2.32

OWASP AppSensor
-

CAPEC
122, 233

SAFECODE
-

${CO_SUIT}

10

${CO_CO10_desc}

OWASP SCP
57, 151, 152, 204, 205, 213, 214

OWASP ASVS
1.11-

OWASP AppSensor
-

CAPEC
68, 438, 439, 442, 524, 538

SAFECODE
15

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${CO_COJ_desc}

OWASP SCP
90, 137, 148, 151-154, 175-179, 186, 192

OWASP ASVS
19.5, 19.9

OWASP AppSensor
-

CAPEC
-

SAFECODE
4

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${CO_COQ_desc}

OWASP SCP
-

OWASP ASVS
4.14, 9.8, 15.1, 15.2

OWASP AppSensor
(All)

CAPEC
-

SAFECODE
1, 27

${CO_SUIT}

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${CO_COK_desc}

OWASP SCP
41, 55

OWASP ASVS
-

OWASP AppSensor
UT1-4, STE3

CAPEC
2, 25, 119, 125

SAFECODE
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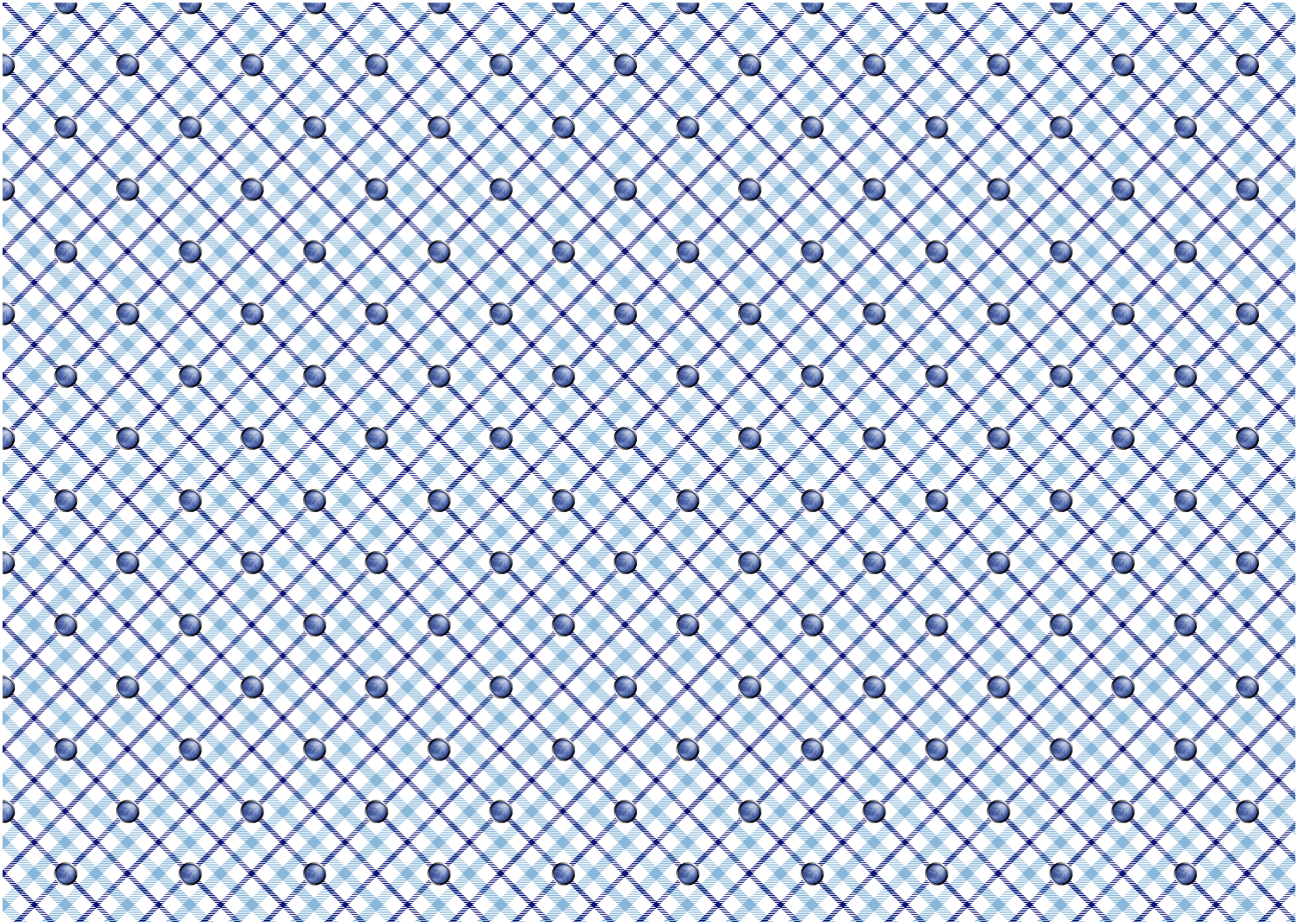

Change Log

Version	Date	Comments
0.10	30 Jul 2012	Original draft.
0.20	10 Aug 2012	Draft reviewed and updated.
0.30	15 Aug 2012	Draft announced OWASP SCP mailing list for comment.
0.40	25 Feb 2013	Play rules updated based on feedback during workshops. Added reference to PCI SSC Information Supplement: PCI DSS E-commerce Guidelines. Descriptive text extended and updated. Added contributors section, page numbering, FAQs and change log.
1.00	25 Feb 2013	Release.
1.01	03 Jun 2013	Framework-specific card deck discussion added. Additional FAQs created. Descriptive text updated. New cover image, and previous cover image moved to back. Cut lines added. Alternative rules and deck subset descriptions added. Project website and mailing list added. Cornucopia King cross-reference to AppSensor updated.
1.02	14 Aug 2013	Warning about time to print added. Additional alternative game rules added (twenty-one, play a deck over a week, play full hand and then discuss). Compliance deck concept added. FAQs 5 and 6 added. Attack descriptions on cards with tinted backgrounds changed to black (from dark grey). Project contributors added.
1.03	18 Sep 2013	Minor attack wording changes on two cards. OWASP SCP and ASVS cross-references checked and updated. Code letters added for suits. All remaining attack descriptions on cards changed to black (from dark grey) and background colours amended to provide more contrast and increase readability.
1.04	01 Feb 2014	Text “password change, password change,” corrected to “password change, password recovery,” on Queen of Authentication card.
1.05	21 Mar 2014	Updates to alternative game rules. Additional FAQs created. Contributors updated. Podcast and video links added.
1.10	04 Mar 2015	Change log date corrected for v1.05. Cross-references updated for 2014 version of ASVS. Contributors updated. Minor text changes to cards to improve readability.
1.20	29 Jun 2016	Video mentioned/linked. Separate score sheet mentioned/linked. Previous embedded score sheet pages deleted. Correction (identified by Tom Brennan) and addition to text on card 8 Authentication. Oana Cornea and other participants at the AppSec EU 2015 project summit added to list of contributors. Darío De Filippis added as project co-leader. Wiki Deck link added. Cross-references updated for ASVS v3.0.1 and CAPEC v2.8. Minor text changes to a small number of cards. Added “-EN” to version number in preparation for “-ES” version. Susana Romaniz added as a contributor to the Spanish translation. Minor text changes to instructions and FAQs.

Project contributors

All OWASP projects rely on the voluntary efforts of people in the software development and information security sectors. They have contributed their time and energy to make suggestions, provide feedback, write, review and edit documentation, give encouragement, trial the game, and promote the concept. Without all their efforts, the project would not have progressed to this point. Please contact the mailing list or project leaders directly, if anyone is missing from the below lists.

- Simon Bennetts
- Tom Brennan
- Fabio Cerullo
- Oana Cornea
- Johanna Curiel
- Todd Dahl
- Luis Enriquez
- Ken Ferris
- Darío De Filippis
- Sebastien Gioria
- Tobias Gondrom
- Timo Goosen
- Anthony Harrison
- John Herrlin
- Jerry Hoff
- Marios Kourtesis
- Antonis Manaras
- Jim Manico
- Mark Miller
- Cam Morris
- Susana Romaniz
- Ravishankar Sahadevan
- Tao Sauvage
- Stephen de Vries
- Colin Watson

- OWASP's hard-working employees, especially Kate Hartmann
- Attendees at OWASP London, OWASP Manchester, OWASP Netherlands and OWASP Scotland chapter meetings, and the London Gamification meetup, who made helpful suggestions and asked challenging questions
- Blackfoot UK Limited for gifting print-ready design files and hundreds of professionally printed card decks for distribution by post and at OWASP chapter meetings
- OWASP NYC for creating an OWASP box design and distributing packs at AppSec USA 2014.

Podcasts and videos

The following supporting OWASP Cornucopia resources are available online:

- Video - Using the cards, created during AppSec EU 2015 project summit, 20th May 2015 https://www.youtube.com/watch?v=i5Y0akWj31k
- Podcast interview, OWASP 24/7 Podcast channel, 21st March 2014 http://trustedsoftwarealliance.com/2014/03/21/the-owasp-cornucopia-project-with-colin-watson/
- Video of presentation, OWASP EU Tour 2013 London, 3rd June 2013 https://www.youtube.com/watch?v=Q_LE-8xNXVk

See the project website for further information and presentation materials.